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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/597,321	03/19/2007	**Haluk Kulah**	UOM0329PUSA	9295

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BROOKS KUSHMAN P.C.
1000 TOWN CENTER
TWENTY-SECOND FLOOR
SOUTHFIELD, MI 48075

EXAMINER	
DOUGHERTY, THOMAS M	
ART UNIT	**PAPER NUMBER**
2834	
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11/18/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/597,321	KULAH ET AL.	
	Examiner	Art Unit	
	Thomas M. Dougherty	2834	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *31 October 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3,4 and 9-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3,4 and 9-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 January 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 3, 4, 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Carroll (US 5,814,921) in view of Takeuchi (US 2002/0172060, previously made of record). Carroll shows (fig. 14) a method for generating electrical power from low frequency, vibrational energy (waves, see ABSTRACT), the method comprising: receiving vibrational energy having a low frequency (as noted, from waves); converting the low frequency, vibrational energy to vibrational energy having a high frequency greater than the low frequency; and converting the high frequency, vibrational energy to electrical power. Note in the ABSTRACT that the piezoelectric devices are electrical generators.

The low frequency is in the range of 1 to 100 Hz.

The step of converting the low frequency, vibrational energy is performed mechanically. See figure 1 where the teeth provide for frequency up conversion.

The step of receiving the low frequency, vibrational energy includes the step of providing a micromechanical first resonator device, the first resonator device resonating in response to the received vibrational energy. This is clear from the discussion and

figure 1.

As noted, the first resonator device has a mechanical resonance frequency in the range of 1 to 100 Hz.

The low frequency is in the range of 1 to 10Hz. Note that wave motion easily falls into this range, although it may be lower or higher.

The step of converting the low frequency, vibrational energy includes the step of providing a micromechanical second resonator device (10), the second resonator device (10) resonating at the high frequency in response to the resonating first eresonator device (16).

The second resonator device (10) includes an array of micromechanical resonators.

Carroll does not note the step of converting the high frequency, vibrational energy being performed electromagnetically.

Takeuchi converting vibrational energy to electrical energy by electromagnetic means.

The step of converting vibrational energy is performed mechanically.

Takeuchi does not note the frequencies applied to his device.

It would have been obvious to one having ordinary skill in the art to employ an electromagnetic means for energy conversion in the device of Carroll at the time of his invention, such as is shown by Takeuchi, since Takeuchi's electromagnetic means allows for "making efficient use of energy compatible with attenuation of the vibration" as he notes in paragraph 14.

Additionally, it would have been obvious to one of ordinary skill in the art to employ the electromagnetic means of Takeuchi in Carroll's device instead of the piezoelectric means since it is well within the skills of a routineer in the art to select a known means on the basis of its suitability for the task.

Additionally, it would have been obvious to one of ordinary skill in the art to employ the electromagnetic means of Takeuchi in Carroll's device since the Examiner takes Official Notice of the equivalence of piezoelectric and electromagnetic means for their use in the power generation art and the selection of any of these known equivalents to generate power would be within the level of ordinary skill in the art. Note that the Applicants themselves admitted interchangeability of piezoelectric and electromagnetic means in their former claim 2.

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Carroll (US 5,814,921) in view of Nishida et al. (US 2004/0007942). Given the device of Carroll as noted above, he does not show his means for converting the high frequency, vibration energy to electrical power, although such means are required for his device to function as he notes.

Nishida et al. show (fig. 1) a micro power generator (100) for generating electrical power, the generator comprising: means for receiving vibrational energy (110) and means for converting the vibrational energy to electrical power (126).

Nishida et al. do not specifically note use of low frequency vibrational energy.

It would have been obvious to one having ordinary skill in the art to allow the device to work in the low frequency range since it has been held that where the general

conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller,* 105 USPQ 233.

Additionally it would have been obvious to one having ordinary skill in the art to provide a means to convert the high frequency, vibrational energy, in Carroll's device to electrical power as is taught by Nishida et al. in order to allow the Carroll device to do useful work, as Nishida et al. show.

Claims 12-21 are rejected under 35 U.S.C. 103(a) as obvious over Nishida et al. (US 2004/0009742) further in view of Takeuchi (US 2002/0172060). Given the invention of Nishida as noted above, again the applied frequency range is not clearly stated.

Takeuchi shows (fig. 4) a generator for generating electrical power from low frequency, vibrational energy, the generator comprising: a first resonator device which resonates in response to the vibrational energy (helical compression of springs, e.g. 72); a second resonator device (generating coil 52); and a circuit coupled to the resonator devices for coupling the resonator devices together so that the second resonator device resonates at a high frequency greater than the low frequency when the first resonator device resonates, the circuit also converting the high frequency, vibrational energy to electrical power. Note that when the spring is compressed at a low frequency rate, it will respond with a vibration of its own in response, at a higher frequency.

The high frequency, vibrational energy is converted electromagnetically.

The low frequency is in the range of 1 to 100 Hz. Note this depends on how the vehicle to which these devices are attached is operated.

The low frequency is in the range of 1 to 10 Hz, as noted above.

The conversion of the low frequency, vibrational energy is performed mechanically (through the springs).

The circuit includes a magnet (e.g. 64) and at least one coil (52) which moves relative to the magnet (64) and wherein voltage is induced on the at least one coil (52) by electromagnetic induction.

As noted, the first resonator device may have a mechanical resonance frequency in the range of 1 to 100 Hz depending on how it is driven.

As noted, at least one of the magnet and the at least one coil is mechanically coupled to the resonator devices so that the magnet and the at least one coil move relative to one another to generate voltage on the at least one coil.

Given that the energy harvesting devices are intended for use in vehicles, they are regarded as capable of operation in the range of 1 to 10 kHz.

The second resonator device includes an array of mechanical resonators and wherein each of the resonators has a coil formed thereon. Note that figure 4 shows an array of magnets and coils for generating power.

Takeuchi et al. don't specifically state that their invention is a micro-device.

It would have been obvious to one having ordinary skill in the art to employ the electromagnetic devices shown by Takeuchi in a micro-device such as is shown by Nishida et al. since such would allow for more power generation given that there is room for more devices.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The remaining prior art cited reads on aspects of the claimed invention.

Direct inquiry to Examiner Dougherty at (571) 272-2022.

/T. M. D./ /Thomas M. Dougherty/

tmd Primary Examiner, Art Unit 2834

November 14, 2008